

REMARKS/ARGUMENT

A corrected sheet of drawings is submitted herewith under cover of a separate letter to the Official Draftsperson.

Claims 79, 80, and 55 have been replaced by new claims 102-104 respectively, and claims 57, 59-60, 62, 64-65, 68, 76, 81, 84-86, 88, 91, and 100 have been amended to better highlight the distinguishing features of the invention, and to address the objections and rejections under 35 U.S.C. 112 in the outstanding Office Action.

The scope of the claims is not, however, believed to have been changed.

Claims 56, 63, 66, 83, 87, and 101 have also been cancelled without prejudice. Accordingly, claims 57-62, 64-65, 67-78, 81-82, 84-86, 88-100, and 102-104 are now pending. As the order of the new independent claims has now been reversed to present the apparatus claims first (i.e., claim 79 has been replaced by claim 102, and claim 55 has been replaced by claim 104), the claims have been presented in Appendix C in logical order for the Examiner's convenience. Numerical order is preserved, however, in Appendices A and B.

Reconsideration of outstanding rejections under 35 U.S.C. 103 based on the Peters et al. U.S. Patent 5,550,375, the Baxter U.S. Patent 4,111,717, the Matarese U.S. Patent 3,908,263, the Grinberg et al. U.S. Patent 4,922,116, the Dschen Published German application 41 10 653, and the Larsson article is requested. It is respectfully submitted that these rejections were inapplicable to previous claims 55-101, and are even less applicable to the present claims.

New claim 102 corresponds to previous claim 79. This claim is directed to a gas detector comprising a gas cell formed by a plastic base plate and a hollow plastic chamber extending from a surface of the base plate, a source of electromagnetic radiation coupled to the gas cell for emission into the chamber, and an electromagnetic radiation detector formed as a three-dimensional topographical structure integral with the base plate and located within the chamber.

Preliminarily, it is important to note that none of the references disclose or suggest such a structure. The closest reference, Peters et al., is the only one even directed specifically to gas detectors, and this differs fundamentally from the structure of claim 102 in that the detectors in the

reference are located *outside* the gas cell chamber. There is no suggestion to locate the detector inside the chamber, and certainly no details as to the structure of the detector.

In particular, claim 102 specifies that the electromagnetic radiation detector is “formed integrally with the base plate” and is comprised of:

a three-dimensional topographical structure formed on the baseplate within the chamber; and

first and second electrically conductive metal layers on the topographical structure,

the metals of the layers being so chosen and positioned that they cooperate to form a thermoelectric element.

The claimed structure, and the location within the gas cell chamber are totally absent from the Peters et al. patent.

In an effort to remedy these critical deficiencies in the principal reference, the Examiner has cited five secondary references, none of which pertain to gas analysis devices, and none of which actually show the claimed structure. The Baxter patent, for example, discloses an essentially two-dimensional thermoelectric array for use in radiation pyrometry. There is no suggestion of a three dimensional topographical structure on which dissimilar metals are deposited to form the thermocouple elements.

The Matarese patent discloses a process for forming so called “interdigitated electrodes” for a charge coupled device without resort to photolithographic techniques. The process involves exposing raised parallel strips on a substrate to a metal vapor directed at the substrate at a particular angle. There is no suggestion that this technique is applicable to fabrication of sensors for gas analysis devices, or to thermoelectric arrays for any application which require deposition of two metals in contact at multiple positions to form individual thermocouple elements.

The German Published Application does disclose forming thermoelectric devices by depositing two metal coatings on a three-dimensional structure from two different angles, but there is no suggestion to use this structure in a gas analysis devices, and in particular, to locate a thermoelectric device formed in this manner *inside* the gas cell.

The Grinberg et al. patent discloses an infrared (IR) simulator formed by an array of pixels defined on a insulating substrate by the use of resistor bridges, which contact the substrate spaced locations and are separated from the substrate and thereby thermally insulated therefrom between the contact locations. There is no suggestion of applicability as a detector for a gas cell, and the individual bridge structures, shown for example in Figs. 4-8, are supported by legs extending from a base silicon on sapphire wafer. This is clearly quite different from the three-dimensional topographical structure formed on the (plastic) baseplate within a chamber; and with first and second electrically conductive metal layers on the topographical structure.

The Larsson article pertains to micro-manufacturing, and discloses various polymer molding techniques for replication of three-dimensional microstructures. The publication also discusses an X-ray lithography technique (LIGA) which has been used, for example, to manufacture optical sensors for gas analysis comprised of arrays of photodiodes. There is no suggestion to apply the polymer molding techniques discussed elsewhere in the article to fabrication of gas analysis detectors, or use of any of the techniques discussed for fabrication of thermoelectric sensors, or of the possibility of constructing a gas analysis device with a sensor integral with a base plate, and *inside* the gas cell itself.

Since none of these references, either alone or in combination suggest the structure called for by claim 102, it is clear that the Examiner has relied solely on applicant's own teachings as the motivation for combining the references. The rejection is accordingly inapplicable to claim 102, and should be withdrawn.

Claim 104 corresponds to original claim 55 and is directed to a method for manufacturing a gas detector comprised of a base plate, a gas cell formed of a chamber attached to the base plate, a source of electromagnetic radiation coupled for emission into the gas cell chamber, and an electromagnetic radiation detector in the form of a thermoelectric array mounted on a three-dimensional topographical structure integral with the base plate and located inside the chamber.

As explained above, the device of Peters et al. does not teach or suggest such a structure, and the motivation for modifying Peters et al. to produce such a structure can only be derived from applicants' own teachings. There is no suggestion of such modifications either in the principal reference or in any of the secondary references.

The claimed method is comprised of the steps of:

forming a master structure as a pattern for the base plate including the three-dimensional topographical structure of the detector;

forming a master structure as a pattern for the structure forming the chamber;

forming the base plate and the chamber using the respective master structures;

There is no teaching or suggestion in any of the references for a method involving forming a master structure as a pattern for a base plate including a three-dimensional topographical structure of a detector located inside the gas cell chamber, and for forming the base plate using the master structure as a pattern. The closest structure; as shown in the Matarese patent, is formed in an entirely different manner using conventional semiconductor fabrication techniques. There is likewise no suggestion of such a method in the German Printed Application, or in the Larsson article.

Moreover, it is entirely wrong in general to say, as the Examiner does in the first paragraph on page 10 of the Office Action, that the claimed method would be inherent in the modified structure of the Peters et al. patent, even if the structure were the same as that of the claimed apparatus. Surely, the Examiner does not believe that there is only one way of manufacturing a given structure? Larsson et al. in fact disclose several alternatives. Can the Examiner not conceive of other ways as well?

Nor is there any legitimate suggestion in the prior art to fabricate an internal thermoelectric sensor array on a topographical structure formed on a base plate by:

applying a first electrically conductive metal layer onto the topographical structure by directing a stream of metal particles toward the base plate at first angle of incidence other than 90°;

applying a second electrically conductive metal layer onto the topographical structure by directing a stream of metal particles toward the base plate at a second angle of incidence other than 90°, with the first and second metal layers being in contact with each other in at least one region on the topographical structure to form the thermoelectric sensor element of the detector . . .

The structure shown in the German Published application is formed in the manner indicated, but there is no suggestion anywhere in this publication, or elsewhere in the prior art to use such a method for forming an internal sensor for a gas analyser. Likewise, whatever relevance the Larsson article may have to micromanufacturing, it does not suggest forming a gas analysis device with internal thermoelectric sensor array inside the gas cell chamber.

Claims 8-82, 84-86, and 88-100, and 103 are dependant on claim 102, and claims 57-62, 64-65, and 67-78 are dependent on claim 104. These claims are patentable for all the reasons stated above. In addition, these claim recite features which, in combination with the features of their respective parent claims are neither taught nor suggested in the cited references.

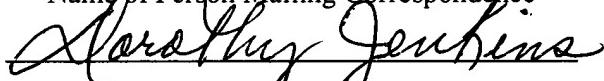
In view of the foregoing, favorable reconsideration and allowance of this application are respectfully solicited.

EXPRESS MAIL CERTIFICATE

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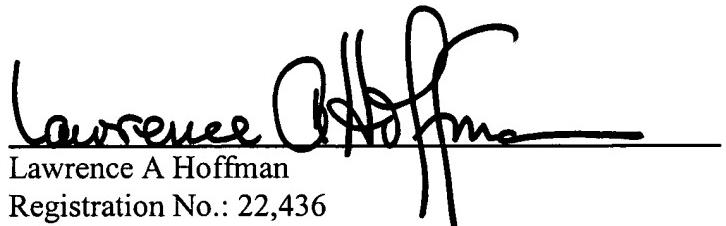
Signature

December 31, 2002

Date of Signature

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APPENDIX A
"CLEAN" VERSION OF EACH PARAGRAPH/SECTION/CLAIM
37 C.F.R. § 1.121(b)(ii) AND (c)(i)

SPECIFICATION:

NO CHANGES

CLAIMS (with indication of amended or new):

57. (Amended) The method of claim 104, wherein the first metal layer is applied to first surface regions of the topographical structure at a first angle of incidence other than 90° to the surface structure, and the second metal layer is applied to second surface regions of the topographical structure at a second angle of incidence other than 90° to the surface structure, such that the first and second metal layers are overlapped at discrete surface parts of the detector.

59. (Amended) The method of claim 104, wherein there is a limited surface region of the base structure, which is less than the entire surface region of the base structure;

the method further comprising applying said detector on the limited surface region, and applying required electric conductors or electric circuits to the thermal element on the limited surface region.

60. (Amended) The method of claim 104, further comprising producing said base structure by topographically shaping the base structure against a die or mold, that exhibits a complementary topographical structure to the topographical structure.

62. (Amended) The method of claim 104, further comprising producing the base structure by a shaping operation against a die or a mold, having a complementary topographical structure for defining the topographical structure of the base structure in the cavity;

forming the mold for the shaping operation by mechanically working a substrate, wherein the configuration of the substrate is complementary with respect to the topographical structure to be formed.

64. (Amended) The method of claim 104, wherein onto the surfaces in the gas cell are applied with the same metals as applied onto the topographical structure associated with the detector at the same time.

65. (Amended) The method of claim 104, wherein the topographical structure is shaped so that applying said metal layers provides connection pads to said detector, electric conductors and circuits for the components before the detector, in addition to providing the metal layers of the detector.

68. (Amended) The method of claim 67, further comprising positioning the source of incident electromagnetic waves with respect to the locations of the ridges such that incident electromagnetic radiation irradiate the upper surfaces of the ridges and such that the intermediate conductive surfaces between ridges are shaded against incident electromagnetic waves by the ridges.

76. (Amended) The method of claim 68, wherein the metal of one of the metal layers has a first reflection coefficient in relation to the electromagnetic waves and that the metal of the other of the metal layers has a second reflection coefficient in relation to the electromagnetic waves; and the conductive ridges are so shaped and located in their positions relative to the incident electromagnetic waves that the metal layer with the lowest one of the first and second reflection coefficients covers the side surfaces that face the incident electromagnetic waves, and the method comprising positioning the metal layer of lowest reflection coefficient to face the incident electromagnetic radiation.

81. (Amended) The detector of claim 102, wherein the first metal layer is positioned on portions of the topographical structure which receive the first metal layer applied to the topographical structure at a first angle of incidence other than 90° and the second metal layer is positioned on portions of the topographical structure which receive the second metal layer applied to the topographical structure at a second angle of incidence other than 90° and different

from the first angle, whereby the first and second metal layers mutually overlap on discrete surface parts of the topographical structure.

84. (Amended) The detector of claim 102, wherein the base structure on which the topographical structure is formed is an integral part, and the detector associated surface parts form an integral part of the inner surface of the cavity.

85. (Amended) The detector of claim 102, wherein the interior of the cavity is coated with the same metal as the topographical structure of the detector.

86. (Amended) The detector of claim 102, wherein the topographical structure is shaped for providing connection pads to the detector, electric conductive paths and circuitry to the metal layers.

88. (Amended) The detector of claim 81, wherein the topographical structure comprises a plurality of conductive ridges extending from the surface of the base structure, each conductive ridge having a first side surface, a second side surface different from the first side surface, and an upper surface facing out of the base structure on which the topographical structure is positioned; an intermediate conductor surface located between adjacent ones of the conductive ridges;

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the metal layers being disposed on the surfaces in a manner such that the first angle of incidence for application of the first metal layer is selected to coat the first side surfaces and at least part of the upper surface of the conductive ridges and at least a part of the intermediate conductive surface between the ridges with the first metal layer, and the second angle of incidence for application of the second metal layer is selected to coat the second side surfaces and at least part of the upper surface of the conductive ridges and at least a part of the intermediate conductive surfaces between the ridges with the second metal layer, and so that the first and second metal layers overlap and provide electric contact on the upper surface of the conductive ridges and on the intermediate conductive surfaces between the conductive ridges,

C9 whereby the metal layers form a series of electrically interconnected junctions between the first and second metal layers.

C10

91. (Amended) The detector of claim 90, wherein the electrically insulated surface sections comprise electrical insulating ridges including respective insulating surfaces disposed relative to each other, relative to the conductive ridges with the conductive surfaces and relative to the first and second angles of incidence for application of the metal layers, so as to exclude application of both the first and the second metal layers on the insulating surfaces for providing electrical insulation within the detector.

C11

100. (Amended) The detector of claim 102, wherein the base structure includes a surface section for receiving at least two of the detectors.

C12

102. (New) A gas detector comprising:
a flat base plate formed of a plastic material;
a gas cell formed by the base plate and a hollow chamber of plastic material extending from a surface of the base plate, the chamber being operative to enclose a volume of gas to be evaluated;
a source of electromagnetic radiation coupled to the gas cell for emission into the chamber;
a coating on an inner surface of the chamber formed of at least one metal layer which is highly reflective surface with regard to the electromagnetic radiation; and
an electromagnetic radiation detector formed integrally with the base plate, the detector being comprised of:
a three-dimensional topographical structure formed on the baseplate within the chamber;
and first and second electrically conductive metal layers on the topographical structure,
the metals of the layers being so chosen and positioned that they cooperate to form a thermoelectric element.

C12

103. (New) The detector of claim 102, wherein the circuit arrangements for the conductive metal layers are located outside the chamber.

104. (New) A method for forming a gas detector comprised of a base plate, a gas cell comprised of a chamber attached to the base plate, a source of electromagnetic radiation coupled for emission into the gas cell chamber, and an electromagnetic radiation detector in the form of a thermoelectric array mounted on a three-dimensional topographical structure integral with the base plate and located inside the chamber, the method comprising the steps of:

forming a master structure as a pattern for the base plate including the three-dimensional topographical structure of the detector;

forming a master structure as a pattern for the structure forming the chamber;

forming the base plate and the chamber using the respective master structures;

depositing at least one metal layer on the inside of the chamber to form the reflective surface thereon;

applying a first electrically conductive metal layer onto the topographical structure by directing a stream of metal particles toward the base plate at first angle of incidence other than 90°;

applying a second electrically conductive metal layer onto the topographical structure by directing a stream of metal particles toward the base plate at a second angle of incidence other than 90°, with the first and second metal layers being in contact with each other in at least one region on the topographical structure to form the thermo-electic sensor element of the detector;

assembling the detector by attaching the chamber to the base plate with sensor enclosed therein; and

positioning the source of electromagnetic energy for emission into the chamber.

APPENDIX B
VERSION WITH MARKINGS TO SHOW CHANGES MADE
37 C.F.R. § 1.121(b)(iii) AND (c)(ii)

SPECIFICATION:

NO CHANGES

CLAIMS:

57. (Amended) The method of claim [55] 104, wherein [onto] the first metal layer is applied to first surface regions of the topographical structure [are applied said first metal layer, applied to the first surface regions] at a first angle of incidence other than 90° to the surface structure, and [onto] the second metal layer is applied to second surface regions of the topographical structure [are applied said second metal layer to the second surface regions of the topographical structure] at a second angle of incidence other than 90° to the surface structure, such that the first and second metal layers are [applied such that the first and second layers are] overlapped at discrete surface parts of the detector.

59. (Amended) The method of claim [55] 104, wherein there is a limited surface region of the base structure, which is less than the entire surface region of the base structure;

the method further comprising applying said detector on the limited surface region, and applying required electric conductors or electric circuits to the thermal element on the limited surface region.

60. (Amended) The method of claim [55] 104, further comprising producing said base structure by topographically shaping the base structure against a die or mold, that exhibits a complementary topographical structure to the topographical structure.

61. The method of claim 60, further comprising producing at least part of the die or mold,

that produces the topographical structure shaping, by a plating process on a model that includes a topographical structure adapted to the structure for the detector.

62. (Amended) The method of claim [55] 104, further comprising producing the base structure by a shaping operation against a die or a mold, having a complementary topographical structure for defining the topographical structure of the base structure in the cavity;

forming the mold for the shaping operation by mechanically working a substrate, wherein the configuration of the substrate is complementary with respect to the topographical structure to be formed.

64. (Amended) The method of claim [55] 104, wherein onto the surfaces in the gas cell are applied with the same metals as applied onto the topographical structure associated with the detector at the same time.

65. (Amended) The method of claim [55] 104, wherein the topographical structure is shaped so that applying said metal layers provides connection pads to said detector, electric conductors and circuits for the components before the detector, in addition to providing the metal layers of the detector.

68. (Amended) The method of claim 67, further comprising positioning the [supply] source of incident electromagnetic waves with respect to the locations of the ridges such that incident electromagnetic [waves] radiation irradiate the upper surfaces of the ridges and such that the intermediate conductive surfaces between ridges are shaded against incident electromagnetic waves by the ridges.

76. (Amended) The method of claim 68, wherein the metal of one of the metal layers has a first reflection coefficient in relation to the electromagnetic waves and that the metal of the other of the metal layers has a second reflection coefficient in relation to the electromagnetic waves; and the conductive ridges are so shaped and located in their positions relative to the incident

electromagnetic waves that the metal layer with the lowest one of the first and second reflection coefficients covers the side surfaces that face the incident electromagnetic waves, and the method comprising positioning the metal layer of lowest reflection coefficient to face the incident electromagnetic [waves] radiation.

81. (Amended) The detector of claim [79] 102, wherein the first metal layer is positioned on portions of the topographical structure which receive the first metal layer applied to the topographical structure at a first angle of incidence other than 90° and the second metal layer is positioned on portions of the topographical structure which receive the second metal layer applied to the topographical structure at a second angle of incidence other than 90° and different [that] from the first angle, whereby the first and second metal layers mutually overlap on discrete surface parts of the topographical structure.

84. (Amended) The detector of claim [79] 102, wherein the base structure on which the topographical structure is formed is an integral part, and the detector associated surface parts form an integral part of the inner surface of the cavity.

85. (Amended) The detector of claim [79] 102, wherein the interior of the cavity is coated with the same metal as the topographical structure of the detector.

86. (Amended) The detector of claim [79] 102, wherein the topographical structure is shaped for providing connection pads to the detector, electric conductive paths and circuitry to the metal layers.

88. (Amended) The detector of claim 81, wherein the topographical structure comprises a plurality of conductive ridges [up] extending from the surface of the base structure, each conductive ridge having a first side surface, a second side surface different from the first side surface, and an upper surface facing out of the base structure on which the topographical

structure is positioned; an intermediate conductor surface located between adjacent ones of the conductive ridges;

the metal layers being disposed on the surfaces in a manner such that the first angle of incidence for application of the first metal layer is selected to coat the first side surfaces and at least part of the upper surface of the conductive ridges and at least a part of the intermediate conductive surface between the ridges with the first metal layer, and the second angle of incidence for application of the second metal layer is selected to coat the second side surfaces and at least part of the upper surface of the conductive ridges and at least a part of the intermediate conductive surfaces between the ridges with the second metal layer, and so that the first and second metal layers overlap and provide electric contact on the upper surface of the conductive ridges and on the intermediate conductive surfaces between the conductive ridges, whereby the metal layers form a series of electrically interconnected junctions between the first and second metal layers.

91. (Amended) The detector of claim 90, wherein the electrically insulated surface sections comprise electrical insulating ridges including respective insulating surfaces disposed relative to each other, relative to the conductive ridges with the conductive surfaces and relative to the first and second angles of incidence for application of the metal layers, so as to exclude application of both the first and the second metal layers on the insulating surfaces for providing electrical insulation within the detector.

100. (Amended) The detector of claim [79] 102, wherein the [first of the] base structure includes a surface section for receiving at least two of the detectors.

APPENDIX C
COMPLETE SET OF "CLEAN" CLAIMS
PURSUANT TO 37 C.F.R. §1.121(C)(3)

102. (New) A gas detector comprising:
- a flat base plate formed of a plastic material;
 - a gas cell formed by the base plate and a hollow chamber of plastic material extending from a surface of the base plate, the chamber being operative to enclose a volume of gas to be evaluated;
 - a source of electromagnetic radiation coupled to the gas cell for emission into the chamber;
 - a coating on an inner surface of the chamber formed of at least one metal layer which is highly reflective surface with regard to the electromagnetic radiation; and
 - an electromagnetic radiation detector formed integrally with the base plate, the detector being comprised of:
 - a three-dimensional topographical structure formed on the baseplate within the chamber;
 - and first and second electrically conductive metal layers on the topographical structure,
 - the metals of the layers being so chosen and positioned that they cooperate to form a thermoelectric element.

103. (New) The detector of claim 102, wherein the circuit arrangements for the conductive metal layers are located outside the chamber.

81. (Amended) The detector of claim 102, wherein the first metal layer is positioned on portions of the topographical structure which receive the first metal layer applied to the topographical structure at a first angle of incidence other than 90° and the second metal layer is positioned on portions of the topographical structure which receive the second metal layer applied to the topographical structure at a second angle of incidence other than 90° and different from the first angle, whereby the first and second metal layers mutually overlap on discrete surface parts of the topographical structure.

82. The detector of claim 81, wherein the first and second metal layers are comprised of respective metals which function as a thermocouple at the discrete surface parts where they overlap.

84. (Amended) The detector of claim 102, wherein the base structure on which the topographical structure is formed is an integral part, and the detector associated surface parts form an integral part of the inner surface of the cavity.

85. (Amended) The detector of claim 102, wherein the interior of the cavity is coated with the same metal as the topographical structure of the detector.

86. (Amended) The detector of claim 102, wherein the topographical structure is shaped for providing connection pads to the detector, electric conductive paths and circuitry to the metal layers.

88. (Amended) The detector of claim 81, wherein the topographical structure comprises a plurality of conductive ridges extending from the surface of the base structure, each conductive ridge having a first side surface, a second side surface different from the first side surface, and an upper surface facing out of the base structure on which the topographical structure is positioned; an intermediate conductor surface located between adjacent ones of the conductive ridges;

the metal layers being disposed on the surfaces in a manner such that the first angle of incidence for application of the first metal layer is selected to coat the first side surfaces and at least part of the upper surface of the conductive ridges and at least a part of the intermediate conductive surface between the ridges with the first metal layer, and the second angle of incidence for application of the second metal layer is selected to coat the second side surfaces and at least part of the upper surface of the conductive ridges and at least a part of the intermediate conductive surfaces between the ridges with the second metal layer, and so that the first and second metal layers overlap and provide electric contact on the upper surface of the conductive ridges and on the intermediate conductive surfaces between the conductive ridges,

whereby the metal layers form a series of electrically interconnected junctions between the first and second metal layers.

89. The detector of claim 88, wherein the topographical structure including the ridges are positioned relative to incident electromagnetic waves so that the waves irradiate the upper surfaces of the ridges but the ridges shadow the intermediate conductive surfaces against incident electromagnetic waves.

90. The detector of claim 88, further comprising electrically insulated surface sections defined between the ridges at the intermediate conductive surfaces and also on surrounding surface sections of the base structure around the topographical structure.

91. (Amended) The detector of claim 90, wherein the electrically insulated surface sections comprise electrical insulating ridges including respective insulating surfaces disposed relative to each other, relative to the conductive ridges with the conductive surfaces and relative to the first and second angles of incidence for application of the metal layers, so as to exclude application of both the first and the second metal layers on the insulating surfaces for providing electrical insulation within the detector.

92. The detector of claim 88, wherein the ridges are configured and arranged on the base structure to form "n" number of columns of the ridges and each of the columns including "m" number of ridges, wherein the number "m" of ridges can differ in respective ones of the columns;

a first one of the ridges in each of the columns, except the "nth" column and except the "mth" ridge within each column, but not the "mth" ridge of the last column, form interconnecting ridges, and the "mth" ridge in each column, except for the last column, is connected electrically with the first ridge of the next following column for causing the junctions between the first and second metal layers at all the ridges in all the columns of the ridges to form a series of electrically interconnected junctions.

93. The detector of claim 92, further comprising an electrically conductive surface section between adjacent columns of the ridges for providing the electrical interconnection between an "mth" ridge of a column and a first ridge in an adjacent column; the conductive surface section being electrically connected with interconnecting ridges in adjacent columns.
94. The detector of claim 88, wherein the series of conductive ridges forms a series connected thermocouple; the metal layer on a first or second side surface of a first ridge or a conductive surface adjacent the first ridge in the series of ridges forms a first thermocouple connecting electrode and a first or second side surface of a last ridge or a conductive surface adjacent the last ridge in the series of ridges forms a second thermocouple connecting electrode.
95. The detector of claim 88, further comprising a heat absorbent layer covering the upper surface of each of the ridges; and
a heat reflecting layer covering the intermediate conductive surfaces between adjacent ridges.
96. The detector of claim 95, wherein the heat absorbing layer is a layer of carbon and the heat reflecting layer is comprised of a metal layer.
97. The detector of claim 89, wherein one of the two metal layers has a first reflection coefficient with respect to the electromagnetic waves and the second metal layer has a second reflection coefficient with respect to the electromagnetic waves; parts of the detector are positioned relative to the incident electromagnetic waves and the metal layers and the conductive ridges are so positioned that the metal having the lowest of the first and second reflection coefficients covers the side surfaces of the ridges that face the incident electromagnetic waves.
98. The detector of claim 81, wherein the metals of the first and second metal layers are different to obtain a thermoelectric effect between the first and second metal layers.

99. The detector of claim 98, wherein the first and second metal layers respectively comprise gold covering chromium.

100. (Amended) The detector of claim 102, wherein the base structure includes a surface section for receiving at least two of the detectors.

104. (New) A method for forming a gas detector comprised of a base plate, a gas cell comprised of a chamber attached to the base plate, a source of electromagnetic radiation coupled for emission into the gas cell chamber, and an electromagnetic radiation detector in the form of a thermoelectric array mounted on a three-dimensional topographical structure integral with the base plate and located inside the chamber, the method comprising the steps of:
forming a master structure as a pattern for the base plate including the three-dimensional topographical structure of the detector;
forming a master structure as a pattern for the structure forming the chamber;
forming the base plate and the chamber using the respective master structures;
depositing at least one metal layer on the inside of the chamber to form the reflective surface thereon;
applying a first electrically conductive metal layer onto the topographical structure by directing a stream of metal particles toward the base plate at first angle of incidence other than 90°;
applying a second electrically conductive metal layer onto the topographical structure by directing a stream of metal particles toward the base plate at a second angle of incidence other than 90°, with the first and second metal layers being in contact with each other in at least one region on the topographical structure to form the thermo-electric sensor element of the detector;
assembling the detector by attaching the chamber to the base plate with sensor enclosed therein; and
positioning the source of electromagnetic energy for emission into the chamber.

57. (Amended) The method of claim 104, wherein the first metal layer is applied to first surface regions of the topographical structure at a first angle of incidence other than 90° to the surface structure, and the second metal layer is applied to second surface regions of the topographical structure at a second angle of incidence other than 90° to the surface structure, such that the first and second metal layers are overlapped at discrete surface parts of the detector.

58. The method of claim 57, wherein said first and second metal layers are comprised of respective metals which, when the first and second metal layers are overlapped, perform the function of a thermocouple at the discrete surface parts of the detector.

59. (Amended) The method of claim 104, wherein there is a limited surface region of the base structure, which is less than the entire surface region of the base structure;

the method further comprising applying said detector on the limited surface region, and applying required electric conductors or electric circuits to the thermal element on the limited surface region.

60. (Amended) The method of claim 104, further comprising producing said base structure by topographically shaping the base structure against a die or mold, that exhibits a complementary topographical structure to the topographical structure.

61. The method of claim 60, further comprising producing at least part of the die or mold, that produces the topographical structure shaping, by a plating process on a model that includes a topographical structure adapted to the structure for the detector.

62. (Amended) The method of claim 104, further comprising producing the base structure by a shaping operation against a die or a mold, having a complementary topographical structure for defining the topographical structure of the base structure in the cavity;

forming the mold for the shaping operation by mechanically working a substrate, wherein the configuration of the substrate is complementary with respect to the topographical structure to be formed.

64. (Amended) The method of claim 104, wherein onto the surfaces in the gas cell are applied with the same metals as applied onto the topographical structure associated with the detector at the same time.

65. (Amended) The method of claim 104, wherein the topographical structure is shaped so that applying said metal layers provides connection pads to said detector, electric conductors and circuits for the components before the detector, in addition to providing the metal layers of the detector.

67. The method of claim 57, further comprising forming the topographical structure of the detector to include a number of ridges, spaced apart from each other, each ridge having opposite first and second side surfaces and an upper surface, and a respective intermediate conductive surface defined between adjacent ridges;

the first angle of incidence of applying the first conductive layer is selected so that the first side surface and at least part of the upper surface of each of the ridges and at least part of the intermediate conductive surfaces between adjacent ridges are coated with the first layer; the second angle of incidence of applying the second conductive layer is selected so that the second side surface and at least part of the upper surface of each of the ridges and at least part of the intermediate conductive surfaces between adjacent ridges are coated with the second layer; wherein the first and second angles of incidence are selected so that the first and second metal layers overlap and form electric contact with each other on the upper surfaces of the ridges and also on the intermediate conductive surfaces between adjacent ridges, causing the metal layers to form a series of electrically interconnected junctions between the first and the second metal layers.

68. (Amended) The method of claim 67, further comprising positioning the source of incident electromagnetic waves with respect to the locations of the ridges such that incident electromagnetic radiation irradiate the upper surfaces of the ridges and such that the intermediate conductive surfaces between ridges are shaded against incident electromagnetic waves by the ridges.

69. The method of claim 67, further comprising forming electrically insulated surface sections between adjacent ridges and with the intermediate conductive surfaces and also surrounding surface sections of the base structure.

70. The method of claim 69, further comprising electrically insulating the insulated surface sections between adjacent ridges by positioning insulating ridges with adjacently located insulating surfaces relative to the conductive ridges and relative to the first and second angles of incidence to exclude coating of both of the first and the second metal layers on the insulating surface sections.

71. The method of claim 67, comprising arranging the conductive ridges in a configuration forming "n" number of columns of ridges with "m" number of ridges in the columns, wherein "m" may be a different number in respective ones of the columns, such that the first ridge in each column except for the "nth" column and the "mth" ridge in each column except for the "nth" column form an interconnecting ridge, wherein the "mth" ridge in each column except the "nth" column is connected to the first ridge of the next following column, such that the resultant junctions, between the first and second metal layers on all of the conductive ridges in all of the columns, form a series of electrically interconnected junctions.

72. The method of claim 71, further comprising forming the electrical interconnection between an "mth" ridge in a column and a ridge in an adjacent column comprises forming an electrically conductive surface section between the adjacent columns such that the conductive

surface is electrically connected to interconnecting ridges belonging to the adjacent columns while being otherwise insulated from the adjacent columns.

73. The method of claim 67, wherein the conductive ridges together form a series connected thermocouple and the intermediate layer on one of the side surfaces of a ridge or a conductive surface adjacent to the ridge in a series of the ridges forms a first thermocouple connecting electrode and a first or second side surface of a last conductive ridge or a conductive surface adjacent the last conductive ridge in a series of the conductive ridges forms a second thermocouple connecting electrode.

74. The method of claim 67, further comprising covering the upper surfaces of the conductive ridges with a heat absorbing layer and covering the intermediate conductive surfaces between the ridges with a heat reflecting layer.

75. The method of claim 74, wherein the heat absorbing layer is comprised of carbon and the heat reflecting layer is comprised of a metal layer.

76. (Amended) The method of claim 68, wherein the metal of one of the metal layers has a first reflection coefficient in relation to the electromagnetic waves and that the metal of the other of the metal layers has a second reflection coefficient in relation to the electromagnetic waves; and the conductive ridges are so shaped and located in their positions relative to the incident electromagnetic waves that the metal layer with the lowest one of the first and second reflection coefficients covers the side surfaces that face the incident electromagnetic waves, and the method comprising positioning the metal layer of lowest reflection coefficient to face the incident electromagnetic radiation.

77. The method of claim 67, wherein the first and second metal layers are of different metals to obtain a thermoelectric effect between the first and the second metal layers.

78. The method of claim 76, wherein the first and second metal layers are respectively comprised of gold which covers chromium.